A Junior Course of Practical Zoology. By the late Prof. A. Milnes Marshall and the late Dr. C. Herbert Hurst. Ninth edition, revised by Prof. F. W. Gamble. Pp. xxxvi+517. (London: John Murray, 1920.) Price 12*s.* net.

THE principal change in the new edition of this admirable and well-established text-book is the substitution of *Dipylidium caninum* for Tænia as an example of a tapeworm. This change has no doubt been determined largely by the common occurrence of Dipylidium and the consequent facility in obtaining sufficient material—especially scolices—for class purposes. The account is illustrated by a page of good figures, but there is an error in the magnification given for Fig. 3. From the point of view of the organs of the segment, Dipylidium—with two sets of reproductive organs in each segment, and the uterus subdivided into capsules in the mature segment—is not so good as Tænia as a type for study by junior students, and for the convenience of those teachers who prefer the latter type a brief description of the organs of the segment of Tænia might be added at the end of the account, together with Figs. 4 and 6 on p. 47 of the previous edition.

In spite of the care with which the book has been edited, a few slips have escaped attention—*e.g.* on p. 12 "Monocystis belongs to . . . the Sporozoa or Gregarines," as if these two terms—one relating to a class, and the other to an order in the class—were synonymous; there is the loose statement on p. 33 that in Obelia some of the buds "have no mouth and become medusæ"; and the amount of acid given in the formula for acid alcohol is incorrect owing to the omission of a decimal point.

Letters to the Editor.

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The Separation of the Isotopes of Chlorine.

MR. CHAPMAN'S conclusion (NATURE, June 17, p. 487) that the isotopes of chlorine should on certain assumptions be capable of separation by chemical means, is clearly wrong, unless there is something not stated in the reasoning to prevent it being applied to the case of a "pure" element, such as, for example, according to the results of Aston, fluorine actually is. Denoting an entirely imaginary difference between two kinds of fluorine atoms by F and F′, the reasoning seems to lead in this case to the obviously absurd result that these two kinds of identical atoms with a purely imaginary difference must be capable of separation by chemical means.

The error appears to be in the equilibrium equation (i)

$$[Cl_2][Cl'_2]=[Cl.Cl']^2.$$

Mr. Chapman does not show how he deduces this, and it is of interest to know whether the error is due to a slip in the application of the theory of chemical equilibria to the case or to a fundamental flaw in that theory. In the present case, if the isotopes are assumed to be chemically identical and the distribution of the two kinds of atoms in the molecules due to pure chance, then if n is the fraction of Cl atoms and $(1-n)$ that of the Cl′ atoms, the fraction of Cl_2 molecules is n^2, of the Cl'_2 molecules $(1-n)^2$, and of the Cl.Cl′ molecules $2n(1-n)$. This gives

$$[Cl_2][Cl'_2]=\tfrac{1}{4}[Cl.Cl']^2,$$

which is in accord with the ratio 9 to 1 to 6, stated by Merton and Hartley for the case $n=0{\cdot}75$ (NATURE, March 25, p. 104), and with Mr. Chapman's own equation (iv) deduced from the assumption that the isotopes are non-separable. FREDERICK SODDY.

A Possible Cause for the Diamagnetism of Bohr's Paramagnetic Hydrogen Atom.

ONE of the difficulties which confronts Bohr's structure of the hydrogen atom is the fact that hydrogen, on his hypothesis, should be paramagnetic, whereas it is, like the majority of the simple gases, diamagnetic. Experiments on the magnetism of gases have, however, always been made above absolute zero, and the atoms must therefore be in motion; and if this motion involves vibrations and rotations of the atom as well as translatory movements, then it is possible for the atom to appear diamagnetic, although it may be inherently paramagnetic. In a paper on "The Mean Magnetic Moment and Mean Energy of a Vibrating Magnet" (Mems. Manchester Lit. and Phil. Soc., vol. lvii., 1913, No. 4) I considered in a simple case how such an effect might arise if a magnet were in a uniform field and free from the influence of neighbouring magnets. In these circumstances, when the vibrations exceed 130° on either side of the position of rest, or if the vibrations pass into rotations, then the magnet will appear to be diamagnetic, because the average time during which the positive and negative poles are in the diamagnetic position is longer than the average time during which they are in the paramagnetic position.

Honda (Phys. Rev., Ser. 2, xiii., 1919) has recently examined at length the effect of all the possible rotational movements of a magnet in his kinetic theory of magnetism, and, with certain assumptions as to the shape of the atom, comes to the same conclusion.

Applying this result to a paramagnetic atom, it is possible that such an atom, in virtue of its motion, may appear to be diamagnetic, and the fact that hydrogen is diamagnetic may be quite consistent with Bohr's paramagnetic model of the atom.

The kind of diamagnetism here considered, which may be called pseudo-diamagnetism, differs from that due to induced electric currents in the atom, which may be regarded as true diamagnetism. Pseudo-diamagnetism will be subject to variation with changes of temperature and with the state of aggregation of the atoms, while true diamagnetism is probably independent of these.

If the diamagnetism of hydrogen should be found to change at a very low temperature and in a very strong field, it would show that the diamagnetism of this gas was probably an effect of the motion of its atoms, and such a result would indirectly help to confirm Bohr's view of the structure of the atom by removing a difficulty. J. R. ASHWORTH.

Rochdale, June 8.

A Stalked Parapineal Vesicle in the Ostrich.

THE ostrich chick on hatching displays an oval, dark-coloured, bare patch towards the hind part of the head. Later, it tends to be hidden by the thick growth of hair-like feathers which cover the head

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generally, but even in the adult it can always be recognised by turning the feathers aside. Its position suggests that it is in some way associated with the pineal body, and dissection reveals a large pineal gland directly beneath, though wholly cut off by the skull. Early stages in the developing chick disclose a yet more remarkable formation in the same region, which leaves no doubt that the bare patch is really a brow spot or pineal spot, the ostrich being the only bird in which a permanent structure of this kind has been described.

Ostrich embryos of about twenty-six days' incubation—the full period being forty-two days—display a large pedunculate vesicle projecting from the middle of the bare patch, surrounded by developing feathers (Fig. 1). The stalk is thick, deeply pigmented, and rounded above, but irregular in outline below, while the vesicle is thin-walled and almost transparent, the whole structure strongly suggesting a stalked eye. The outgrowth persists for a few days only, but all ostrich chicks from about twenty to thirty days' incubation reveal one stage or another in its development or retrogression.

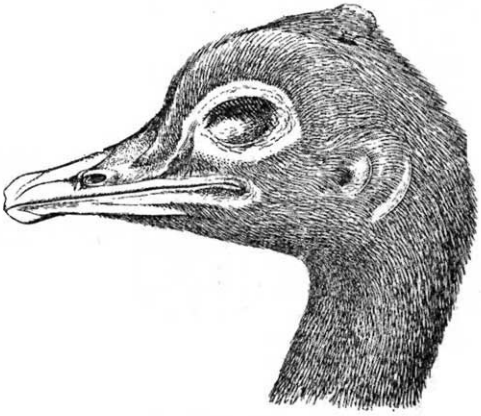
FIG. 1.

Microscopic sections through the fully developed organ reveal the condition represented in Fig. 2. The stalk is solid and broad below, with a thick epidermis produced into small, irregular fimbriations and deeply pigmented, while the vesicle is extremely thin-walled and filled with a coagulable fluid. The underlying dermal tissue is continued unchanged into the stalk, but below it has undergone a peculiar sclerose modification. The whole structure is thus tegumental and destitute of any special nervous or sensory elements. Beneath it, but not represented in the figure, is the well-developed pineal gland resting upon the pouch-like dorsal sac. Before the vesicle is fully formed, sections reveal that the basal part of the stalk is double, as if two stalks have become fused, but only one has elongated, and ends in the vesicle. At a late stage in retrogression the two components are quite distinct.

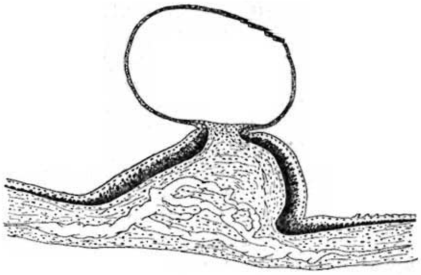
FIG. 2.

A pedunculate vesicle, arising from the middle of the head, renders the ostrich unique among birds as well as among the entire vertebrate series. Its general association, however, leaves no doubt that it is a part of the pineal complex. The latter has, therefore, been investigated from the earliest chick stage, and many significant features have been disclosed. The primary pineal vesicle or epiphysis appears about the third day of incubation as a simple, globular, median outgrowth of the roof of the thalamencephalon; later, it forms a dense follicular system, and communication with the third ventricle is lost. At the time of its formation a small, solid upgrowth takes place just anterior to it, and situated on the right side, afterwards becoming tubular and detached, and extending upwards and forwards over the left cerebral hemisphere. All the evidence points to this as a vestigeal parapineal organ, arising in close association with the pineal organ, but detached from it. It disappears about the tenth day of incubation. A paraphysial upgrowth arises in front of the velum transversum, but persists for a few days only, and a dorsal sac situated immediately under the pineal gland is strongly developed.

It is submitted that the vesicle is the embryonic, persistent, integumental covering of a stalked parietal eye which was present in the ancestors of the ostrich. The sensory part of cerebral origin has degenerated, as in all birds, but the protective corneal covering of transparent epidermis and dermis which would envelop it as it pushed its way upwards still reappears in the embryo, remains for a very brief period, and then retrogresses, the pineal patch being all that persists in later life. The unique stalked character of the eye is manifestly a peculiarity to be correlated with the presence of a covering of feathers in birds.

J. E. DUERDEN.

The Alligator Pear.

THE important notice of *Persea gratissima* in NATURE of May 27 may be usefully supplemented from Madeira, where, during the last sixty years, from ten or a dozen examples, the tree has become familiar in every garden enclosure on the lower 500 ft. of our mountain-sides—cultivated for its attractive form and autumnal yield of valuable fruit.

The revival of the short voyage from Madeira, three days and a half, to Southampton has restored the alligator pear to its former importance in the London market, for no other locality can offer equal facility for presenting this valuable esculent in condition to satisfy the educated palate of those who know the flavour of the fresh fruit.

Grown from seed, *P. gratissima* begins to bear fruit in from seven to ten years, attaining full maturity in twenty years, when it has grown into a spreading tree 30 ft. high or more, with dense light green foliage, maturing an abundant crop in September and October.

A single tree in full bearing will yield a market value of from 8*l.* to 15*l.*, and the rich nutty-flavoured fruit is in growing demand.

In Madeira no serious efforts have been directed to the improvement of the alligator pear, either by selection or grafting, and the large central seed still remains as a reproach to us; but the stimulus of increasing commercial value is at hand, and preference will be given to increased food value. Some years ago I suggested that the tree might be usefully grafted on to *Persea indica*, one of the four Madeiran laurels, much hardier and with greater range, hoping

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